

REMARKS

Claims 1-34 remain pending in this application. Despite previous allowance of claims, all claims currently stand rejected.

Applicant's last response to Office Action dated May 26, 2005 was intended to reply completely and with courtesy to Examiner. It is unclear how or why retraction of allowance occurred.

It is believed that the remarks laid out herein below attend to all rejections and further issues raised in the pending office action dated September 8, 2005.

Response to Drawings

As per 37 C.F.R. §1.81(a), applicant is required to furnish a drawing of his or her invention "where necessary for the understanding of the subject matter sought to be patented". 37 C.F.R. §1.83(a) is at odds with 37 C.F.R. §1.81(a) for §1.81(a) makes clear that a patent may be obtained without any drawings, where the understanding of the subject matter is clear.

Without accepting the conflicting view of §1.83(a), applicant notes that drawings have been provided to supplement and enhance the descriptions provided by the written disclosure. Examiner has failed to identify the element(s) not shown in the drawings. It is assumed that Examiner is objecting to the integration of the display **300** with the array **102** of MTJ cells **104**.

Respectfully, FIG. 3 provides a plain cross sectional view of a portion of the soft reference magnetic memory digitizing device of FIG. 1 including an integrated display **300** (Page 11, third full paragraph). FIG. 1 shows a portion of an array **102** of soft-reference magnetic memory tunnel junction memory cells **104**.

"FIG. 4 illustrates a schematic diagram of a portion of an array of pixels as controlled by a MTJ cell **104** as integrated in a single touch-screen display system. Shown are a pixel **400** (represented as the contents within the dotted line), a pixel enable line **402**, a row voltage line **404** and a column voltage line **406**. A MTJ cell **104** is fixed between the row **404** and column **406** voltage lines. Voltage line **406** is then further coupled to a field effect transistor **408**, or other appropriate switching device. The power source for the transistor **408** is coupled to the pixel enable line **402**. Transistor **408** thereby controls pixel diode **410** in accordance with the state of the MTJ cell **104**. Each pixel diode **410** is coupled to a capacitor **412** to provide a constant source of power to the pixel diode **410** when it is active." Page 11, last paragraph.

However, in light of Examiner's request, applicant has prepared and submits herewith a new drawing FIG. 6 which further illustrates the display **300** comprised of an array of pixels **302**, each integrated with a MTJ cell **104**. The schematic diagram of FIG. 4 is still believed

sufficient to conceptually illustrate how at least one method of such integration may be accomplished.

As FIG. 6 is newly submitted, drawing pages 1 through 6 have been amended to reflect the new total of seven (7) pages.

Claim Rejections under 35 U.S.C. §112

In this third office action, Examiner is for the first time rejecting claims 1-34 under 35 U.S.C. §112 first paragraph as failing to comply with the enablement requirement.

Examiner stated, first:

"It is not understood how the orientation of the array of soft-reference magnetic memory cells can be changed upon the application of the externally-applied magnetic field as applied by a magnetically tipped stylus as show in the drawings of the present invention and as recited in claims 1-3 since first the direction of the orientation of magnetization of the memory array **102** of the present invention is determined by the external magnetic field provided by an externally supplied current through row **208** and column **210** as clearly defined in lines 2-8, page 8 of the specification;" Office Action page 3

Examiner's confusion may be due in part to a misinterpreting of the above cited section. The externally provided current serves to dynamically align the soft-reference layer **206**. "Such dynamic setting during a read operation may be achieved by magnetic fields provided by an externally supplied current flowing through the row **208** and the column **210** intersecting at MTJ cell **104**. As stated in the description, a convention is adopted for the dynamic orientation of the soft-reference layer, i.e., it will be aligned to the Left dynamically during read operations.

This paragraph, and indeed the portion identified by Examiner, does not speak to the orientation of the entire MTJ cell **102**, rather it specifically addresses the dynamic orientation properties of the soft-reference layer **204**. This paragraph has been amended to further clarify this point, and no new matter has been added. Generally, when referring to the orientation of the MTJ cell it is understood and appreciated by those in the art that it is the orientation of the sense layer that is actually at issue. Applicant has amended claims 1 and 2 to further clarify this issue.

As is described in the paragraph running from the bottom of page 7 to the top of page 8 of the application, the orientation of the sense layer **202** is changed from its initialized Right orientation to a Left orientation by the proximate application of an externally applied magnetic field **212**. This field is sufficient to overcome the coercivity of the sense layer **202**, and the sense layer **202** will remain in the new orientation after the removal of the externally applied magnetic field **212**.

As stated in the description, a comparison between M1 and M2 is accomplished by measuring the resistance within the MTJ cell **104**. As stated in the background on page 3, parallel alignment results in low resistance, while anti-parallel alignment results in high resistance. The last paragraph on page 8, continuing to page 9, has been amended to further clarify this point, and no new matter has been added.

To summarize for Examiner, the externally applied magnetic field provided by magnetic stylus orients the sense layer **202**. During a read operation current is supplied by row **208** and column **210** to dynamically set the orientation of soft-reference layer **206**. A measure of the resistance through MTJ cell **104** is then taken to determine the orientation of sense layer **202**, and thus the overall orientation of MTJ cell.

Applicant believes that claims 1-3 are in proper order under 35 U.S.C. §112, first paragraph. Withdrawal of Examiner's rejection and allowance of the claims 1-34 is therefore respectfully requested.

Examiner states, secondly:

"it is not understood how the magnetically tipped stylus **110** can be pointed to more than one memory cell in the memory array **102** at the same time to carry out the refresh operation for substantially all memory cells in the array as recited in claims 21-28." Office Action page 3

Independent claims 21 and 26 both recite "refreshing the array by applying a refresh current sufficient to generate a re-refresh magnetic field sufficient to align substantially all the sense layers to a predetermined orientation."

As is described in detail in the specification, the orientation of the sense layer **202** is changed from an initial orientation state of Right to an orientation of Left by the proximate application of an externally applied magnetic field. The sense layer **202** is refreshed to the initial orientation state of Right by "applying a refresh current sufficient to generate a refresh magnetic field sufficient to align substantially all the sense layers to a predetermined orientation." Amended claim 21. This refresh process is further described in the specification in greater detail on pages 10 and 11, some paragraphs of which have been amended as indicated above for further clarification.

Examiner's apparent confusion appears to stem from the misperception that the external stylus is responsible for the refresh operation. This is not the case. The external stylus provides a magnetic field sufficient to overcome the coercivity of the sense layer **202**. It is also understood and appreciated that other substantially strong magnetic fields of equal or greater intensity will also overcome the coercivity of the sense layer **202** if they are sufficiently

close. As described in the text, the device is capable of internally generating a re-fresh magnetic field that is also sufficient to overcome the coercivity of the sense layer **202**.

The notation in the preamble of independent claim 21 is not a limitation excluding such other fields.

Applicant believes that claims 21-28 are in proper order under 35 U.S.C. §112, first paragraph. Withdrawal of Examiner's rejection and allowance of the claims 1-34 is therefore respectfully requested.

Examiner states, thirdly:

"It is not understood {how} the orientation of the magnetization of a given memory cells can be shown by a display as recited in claims 3, 8-9, 14-15, 19-20, 23-24, 28-29, and 34. Since the display characterized by an array of pixels having each memory cell being coupled to at least one pixel is not shown in the drawings of the present invention." Office Action page 3

Respectfully, FIG. 3 provides a plain cross sectional view of a portion of a soft-reference magnetic memory digitizing device of FIG. 1 further including an integrated display **300**, the display having an array of pixels **302**. FIG. 4 provides a schematic diagram of a soft reference magnetic memory cell shown in FIG. 3 controlling a display pixel. Applicant has added a new drawing, FIG. 6, providing a perspective view of a portion of a soft-reference magnetic memory digitizing device incorporating a display **300** and an array of pixels **302..302"**.

A more detailed description of FIGs. 3, 4 and 6 is found on pages 10 and 11 of the specification. In addition, applicant has amended the last full paragraph on page 11 to further clarify these points and describe FIG. 6. No new matter has been added.

Applicant believes that claims 3, 8-9, 14-15, 19-20, 23-24, 28-29, and 34 are in proper order under 35 U.S.C. §112, first paragraph and requests reconsideration.

Examiner states, fourthly:

"It is not understood what type of refresh operation as described in the specification and as recited in the claims 21-28. Since magnetic memory device has been widely well known as having no need of refresh operation." Office Action page 4

Respectfully, Examiner appears to be confused as to the purpose of the refresh operation described by applicant. The refresh operation disclosed is not intended to perpetuate the set orientation of each cell as is commonly required in volatile memory cells, but rather to reset the orientation of any changed MTJ cells back to an initial orientation.

The purpose and function of the soft-reference digitizing device as described in the specification is to detect a user initiated change in orientation of at least one sense layer by applying an external magnetic field with a stylus. The occurrence of such a user drive event is determined by evaluating the relative alignments of M1 and M2 in read operations. A refresh operation is performed to reset the orientation of the sense layers that have been changed so as to again detect user initiated change in the sense layer.

Moreover, the refresh is not performed to perpetuate the state of the MTJ cell to maintain the user directed change in orientation, but rather to remove that orientation by returning all MTJ cells to their initial orientation, e.g., a Right orientation.

Applicant believes that claims 21-28 are in proper order under 35 U.S.C. §112, first paragraph and requests reconsideration.

Examiner has not identified an issue of concern with respect to claims 4-7, 10-13, 16-18 and 30-33 as regards 35 U.S.C. §112, first paragraph. To the extent that such issues may exist it is believed that the above statements and clarifications are equally applicable. Applicant believes that claims 4-7, 10-13, 16-18 and 30-33 are in proper order under 35 U.S.C. §112, first paragraph. Withdrawal of Examiner's rejection and allowance of the claims 1-34 is therefore respectfully requested.

Examiner has rejected claims 1-4 8, 10, 14, 16, 20-21, 23, 25-26, 28, 30, 32 and 32 under 35 U.S.C. §112, second paragraph for informalities in antecedent basis. Applicant thanks Examiner for the identification of such issues and has carefully corrected such antecedent basis issues for each claim, either directly within the claim or in the claim from which the claim depends. Applicant believes that claims 1-4 8, 10, 14, 16, 20-21, 23, 25-26, 28, 30, 32 and 32 are in proper order under 35 U.S.C. §112, first paragraph. Withdrawal of Examiner's rejection and allowance of the claims 1-34 is therefore respectfully requested.

Double Patenting

Claims 1-34 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-30 of U.S. Patent No. 6,760,016, claims 1-19 of U.S. Patent No. 6,781,578, claims 1-24 of U.S. Patent No. 6,798,404, and claims 1-21 of U.S. Patent No. 6,924,793.

Applicant notes that Examiner provides no detailed support or specific reasoning to support this rejection. Only a general assertion regarding the claims of the '016, '578, '404 and '793 patents is provided.

Respectfully, U.S. Patents 6,760,016, 6,781,578 and 6,798,404 all teach MRAM cell having pinned reference layers. In each patent the MRAM cell 106 is taught to have a pinned

layer, "[t]he pinned layer 304 has a magnetic orientation that is fixed so as not to rotate in the presence of an applied magnetic field in the range of interest." '016 – Col. 4 lines 50-52, '578 – Col. 5. lines 17-19, '404 – Col. 5 lines 17-19. None of these patents mentions or discusses the use of soft-reference MTJ cells **104** as taught by applicant in the present application. Indeed these patents teach devices which rely on MRAM cells having fixed reference layers. No teaching or suggestion is provided to suggest otherwise.

U.S. Patent 6,924,793 teaches simply the use of MRAM cells which are desirable because they hold their orientation indefinitely. No teaching or suggestion is to be found anywhere for the use of soft-reference MRAM cells.

Applicant submits that none of the claims of the '016, '578, '404 and '793 patents teach or suggest the limitations of the application. More specifically, none of the patent references teach or suggest a soft-reference MRAM cell, or more specifically, a soft-reference layer having a non-pinned orientation of magnetization.

In the application at hand, applicant has set forth numerous advantages that may be realized through the use of the soft-reference digitizing device over the prior art, such as, but not limited to, reducing if not eliminating the offset in the coercive switching field, reducing the required magnetic field **212** of the stylus **110**, reducing magnetic shielding requirements, and the avoidance of high temperatures during manufacturing as is required to establish a fixed or pinned reference layer.

In accordance with MPEP §804(B)(1), it is noted that a double patenting rejection of the obviousness type is analogous to [a failure to meet] the nonobviousness requirement of 35 U.S.C. §103 and therefore parallels the guidelines for analysis of a 35 U.S.C. §103 obviousness determination. *In re Braat*, 937 F.2d 589, 19 USPQ2d 1289 (Fed. Cir. 1991); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985).

To establish a *prima facie* case of obviousness, three basic criteria must be met.

First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the references or to combine reference teachings.

Second, there must be a reasonable expectation of success.

Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The **teaching or suggestion** to make the claimed combination **and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure.** (emphasis and formatting added) MPEP § 2143, *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991)

First, in none of these references can there be found a suggestion or motivation to use soft-reference MRAM cells in place of the pinned reference layers as specifically taught in '016, '578 and '404. Second, soft-reference MRAM cells require different operational conditions to achieve purposefully dynamic alignment, without these conditions there will be no reasonable expectation of success. Third, the references when taken individually or as a whole simply do not teach or suggest either the use of soft-reference MRAM cells or the necessary operational conditions that would also be required for an expectation of success.

It is of course incumbent upon the Examiner to establish a factual basis to support the legal conclusion of obviousness. *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). Respectfully, Examiner has not met the minimum burden necessary to substantiate a finding of obviousness.

In light of this failing, applicant believe that claims 1-34 are patentable over '016, '578, '404 and '793. Withdrawal of Examiner's rejection and allowance of the claims 1-34 is therefore respectfully requested.

Claim Rejections under 35 U.S.C. §103

The Examiner has rejected claims 1-34 as being unattainable over U.S. Patent 6,603,677 to Redon et al. ("Redon"), in view of U.S. Patent 6,121,771 to Moser.

When applying 35 U.S.C. §103, the following tenets of patent law must be adhered to:

- (A) The Claimed invention must be considered as a whole;
- (B) The references must be considered as a whole and must suggest the desirability and thus the obviousness of making the combination;
- (C) The references must be viewed without the benefit of impermissible hindsight vision afforded by the Claimed invention; and
- (D) Reasonable expectation of success is the standard with which obviousness is determined. MPEP §2141.01, *Hodosh v. Block Drug Co., Inc.*, 786 F.2d 1136, 1134 n.5, 229 USPQ 182, 187 n.5 (Fed. Cir. 1986).

A brief summary of Redon and Moser may be helpful in understanding how these references fail to combine as Examiner suggests.

Redon teaches the use of MRAM tunnel cells having an anchored layer 12 and a free layer 16, col. 4, lines 40-44, which are more specifically identified in Redon's claim 1 as:

"...a first magnetic layer having a **fixed magnetization direction** and configured to spin polarize a writing current of electrons, {*the anchored layer 12*}

a second magnetic layer having a first tri-layer stack that includes two magnetic layers with anti-parallel magnetizations, separated by a first conducting non-magnetic layer, **said second magnetic layer having a variable magnetization direction** oriented as a function of a direction of a

spin polarized writing current of electrons having a predetermined writing density, ..."*the free layer 16* Col 8, lines 12-21, emphasis added.

The use of a bi-directional arrow in FIGs. 1A and 1B with junction 2 is apparently provided to illustrate the variable magnetization of direction of the free layer 16, whereas the oriented arrow in FIGs. 1A and 1B is apparently provided to illustrate the anchored layer 12. Free layer 16 is further identified as including layers 161 and 163. Anchored layer 12 is further identified as including layers 121 and 123. Anchored layer 12 is set in a fixed orientation and can not be altered.

As stated, "the invention aims to reduce the critical current density from which magnetization reversal occurs in the free layer." Col. 2, lines 49-50. To write a "0" or a "1" a current of sufficient magnitude is passed through the junction, with a density greater than the critical density, to generate precise alignment of the magnetization in the free layer (161), Col 4 lines 26-29, and Col. 5 lines 20-65.

It is the free layer 16 that serves to store the desired "0" or "1" bit value. Anchored layer 12 does not change and is unaffected by the writing currents. To read the value represented by the orientation of free layer 16, "a current is passed whose density is lower than the critical density. Col. 5, lines 66-67. The read current is insufficient to reorient free layer 16. Redon's use of the term "free layer" is unfortunate, for although free layer 16 is free to be re-oriented, it is clear that it will hold a desired orientation. Anchored layer 12 serves as the reference layer to determine the orientation of free layer 16. Moreover, according to Redon ***only one layer has variable magnetization direction.***

Further, Examiner's assessment that magnetic field 9 is external is in error. Magnetic field 9 is provided by a current flowing in conductor 8, shown as physically separate from junction 2, but in no way taught or suggested as being external to the system.

Moser teaches a magnetic force microscopy probe for use in scanning a sample. Indeed the probe has a magnetic tip. The length to weight ratio of the tip is selected to stabilize the tip in the presence of external magnetic fields, including fields from the sample. Col. 2, lines 29-33.

"Magnetic field gradients from the sample exert a force on the magnetic moment of the tip, and monitoring the tip/cantilever response gives a magnetic force image." Col. 3, lines 15-18. Deflection of the tip is monitored by referencing a laser beam from a laser off the cantilever and into a photodiode, and an image is formed by mapping the laser detected deflection while scanning. Col. 3, lines 2-5.

The tip responds to magnetic fields ***from*** the sample. The tip does not provide a field that effects or alters the sample.

Neither Redon nor Moser teach a soft-reference magnetic memory digitizing device. More specifically, neither reference teaches

"an array of soft-reference magnetic memory cells, each characterized by an alterable orientation of magnetization, the orientation changing upon a substantially proximate application of at least one externally-applied magnetic field as applied by a magnetically tipped stylus." Claim 1

As is set forth in applicant's detailed description, each soft-reference cells has a sense layer characterized by an alterable orientation of magnetization, the orientation changing upon a substantially proximate application of at least one externally-applied magnetic field. Each soft-reference cell also has a soft-reference layer having a non-pinned orientation of magnetization. More specifically, in contrast to the magnetic junction cells set forth by Redon which require at least one anchored layer – a layer which has a fixed and unalterable magnetic orientation – no anchored layer is present in the soft-reference MRAM cells as set forth by applicant.

More simply stated, whereas Redon teaches and requires at least one anchored and one alterable layer of magnetic orientation, applicant teaches a device having two alterable layers of magnetic orientation. Redon provides no suggestion or motivation to replace the junction cell of Redon with a soft-reference MRAM cell. To do so would render Redon inoperable as the anchored layer is required both for monitoring during the write "0" process (Col. 5 lines 51-54) and for the read operations.

Moreover, MRAM cells with pinned reference layers are fundamentally different from MRAM cells with soft-reference layers. Absent clear and precise teachings as to how a substitution may be performed and the components that must be modified to accommodate such a substitution, soft-reference and pinned reference MRAM cells are not interchangeable.

Redon in view of Moser does not spontaneously alter the reliance of Redon upon an anchored layer. In addition, the cantilever of Moser provides a magnetic tip so that the tip is affected by a sample. The magnetic tip does not alter the sample, and there is no teaching or suggestion to be found in Moser that it should do so. Combining Moser with Redon would, if even possible, result in a device where the magnetic tip was affected by the magnetic field of the junction cell, the tip being thus deflected. There is no teaching, suggestion or motivation that would have the magnetic tip 20 of Moser change behavior and affect the free layer 16 of Redon. Such a change in behavior would also render Moser useless for its intended purpose.

Respectfully, as set forth by MPEP §2143, to establish a prima facie case of obviousness, there must be first some suggestion or motivation to modify and combine the references. Second, there must be a reasonable expectation of success and third, the teaching

or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not based on applicant's disclosure.

Redon in view of Moser fails at the outset to teach or suggest an array of soft-reference magnetic memory cells. The combination of references does not spontaneously yield an array of soft-reference magnetic memory cells, or a soft-reference magnetic memory digitizing device as set forth by applicant.

In light of these failings, applicant believes that claims 1-34 are patentable over the Redon and Moser. Withdrawal of Examiner's rejection and allowance of claims 1-34 is therefore respectfully requested.

CONCLUSION

In view of the above Remarks applicant has addressed all issues raised in the Office Action dated September 8, 2005, and respectfully solicits a Notice of Allowance for claims 1-34. Should any issues remain, the Examiner is encouraged to telephone the undersigned attorney.

It is believed that all of the pending claims have been addressed. However, the absence of a reply to a specific rejection, issue or comment does not signify agreement with or concession of that rejection, issue or comment. In addition, because the arguments made above may not be exhaustive, there may be reasons for patentability of any or all pending claims (or other claims) that have not been expressed. Finally, nothing in this paper should be construed as an intent to concede any issue with regard to any claim, except as specifically stated in this paper, and the amendment of any claim does not necessarily signify concession of unpatentability of the claim prior to its amendment.

Applicant believes that no fees are due; however, should any fee be deemed necessary in connection with this Amendment and Response, the Commissioner is authorized to charge deposit account 08-2025, referencing the Attorney Docket Number 200300379-1.

Respectfully submitted,

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